The Differences of Nitrates Between Moving and Still Bodies of Water in Whatcom's Waterways

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Intro to Earth Science (GEOL100)

Research Question & Background

We were curious to know if the movement of water keep nitrate levels lower naturally, as the water cycles out of the river constantly. The water that is part of still bodies take a much longer time to go through this process. Nitrates are what we were interested in collecting data for because it is a form of nitrogen, and excess nitrogen in waterways can "cause significant water quality problems" (2012). This is important to take note in because of the activity around our sample sites, as the land around the Nooksack River is primarily agricultural, which is a known source for excess nitrates, and there are toxic shellfish warning signs around the bay due to fecal nitrates (biotoxins). As a group, we were curious to see if there would be a difference in nitrate levels between constantly moving water and relatively still bodies of water- lakes and bays. We were also interested to see if there were any unhealthy nitrate levels at any of our sample sites.

Hypothesis

We believe that nitrate levels will be lower in bodies of water that are constantly flowing, while being higher in relatively still water.

Methods

Materials

- Vials
- Nitrate test strips, 2 for each location (Sensafe strips)

Methods

- Nitrate testing

Procedure

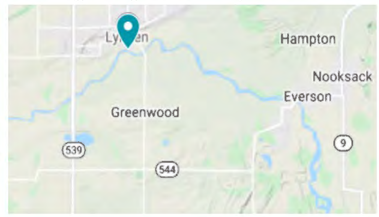
For each test, the nitrate strip needs to be removed from its packaging, dipped in a sample of water separated from the source for 2 seconds, wait for one minute, then immediately compare it to the PPM color chart.

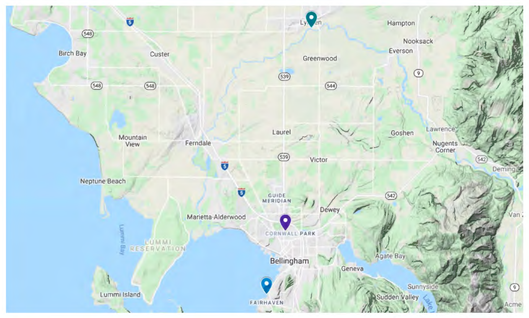
Fig. 1 Nooksack River testing location post to late November flooding in 2021

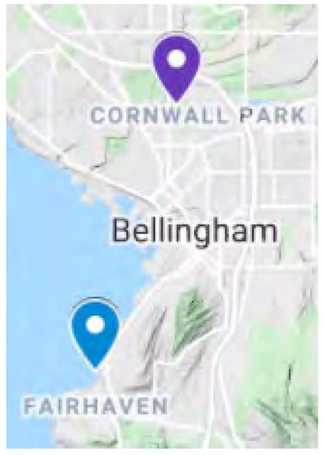
Nitrate Test Locations

Body of Water	PPM of Water	Time of Collection
Bellingham Bay 1	0.5	5:48 pm PST
Bellingham Bay Round 2	1	7:17 pm PST, December 1st, 2021
Nooksack River	1.2	2:33 pm PST, November 17th, 2021
Squalicum Creek	1	8:00 am PST, December 2nd, 2021

Table 1. Table providing location of sample sites and PPM (parts per million)







Nitrates of Whatcom Waterways

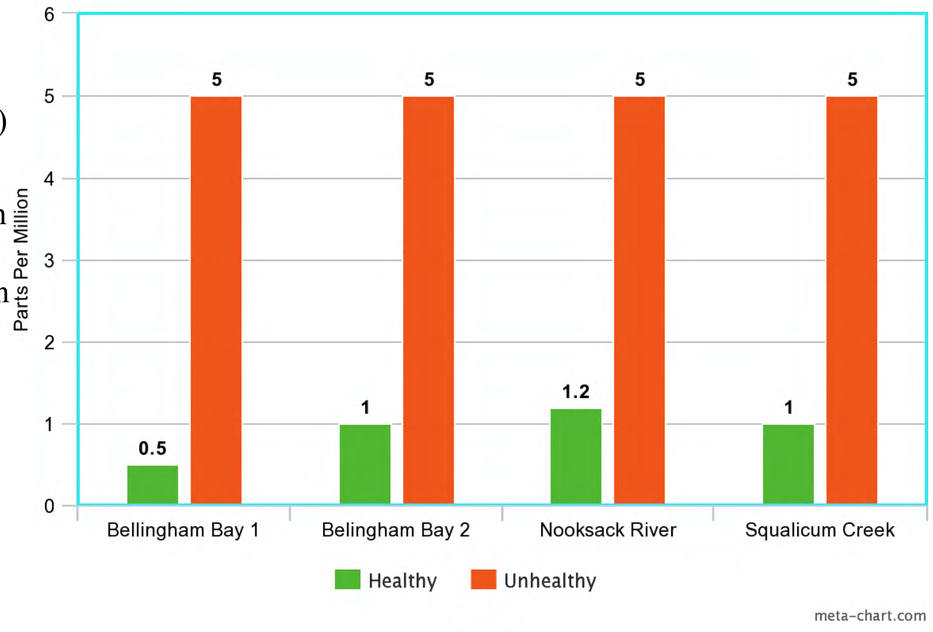
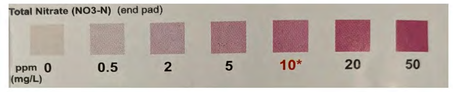


Figure 2. Graph comparing nitrate levels between two samples from Bellingham Bay, the Nooksack River, and Squalicum Creek to unhealthy nitrate levels

Interpretations

Concentrations of nitrates only become harmful once levels hit 10 ppm (parts per million) and beyond.



All our samples came back with a ppm lower than 2.

Implications

This data disproved our hypothesis, showing little to no difference between faster moving water versus relatively still water. While the data tells us that the nitrate levels are safe at all sample sites, that does not mean that excess runoff is not occurring. There has been 2 major flooding events throughout Whatcom County within the last month alone, and during both the Nooksack River jumped the banks. This is a problem because there is dairy farming all along the river, and this jump undoubtably brought excess cow feces into the river, possibly raising nitrate levels.

Limitations

One of the many limitations we faced was a lack of data over a length of time, meaning that results needed to be taken with a grain of salt, as the nitrate levels are likely to fluctuate over time. This is a limitation we could not rectify as we had limited amount of time to work with. There was also the limitation of our very few sample sites. Another limitation we faced was the failing of our first round of tests at the Bellingham Bay site, as the nitrate strips did not change color the first time, which forced Allayna to collect another data sample on short notice. Tidal movement in the bay also poses as a limitation, as it creates a margin of error.

Acknowledgements

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Work Cited

United States Environmental Protection Agency. (2012, March 6). *5.7 nitrates*. EPA. Retrieved December 7, 2021, from https://archive.epa.gov/water/archive/web/html/vms57.html.